1   Q.   Mr. Floyd testifies (p. 9) that a "Benchmark Cost Model" (BCM) is incorporated

2   "as an integral part" of the Hatfield model. What is the BCM?

3   A.   The BCM[2], which was filed with the FCC by MCI, NYNEX, Sprint, and U.S.

4   West in September 1995, identifies geographic areas where the costs of providing

5   basic residential access service are relatively high or low. The purpose of the

6   model was to aid in targeting universal service funding for high cost areas. The

7   sponsors describe their model as follows:

8   The BCM does not define the actual cost of any telephone
9   company, nor the embedded cost that a company might experience
10   in providing telephone service today. Rather the BCM provides a
11   benchmark measurement of the *relative* costs of serving customers
12   residing in given areas, i.e., the CBGs [Census Block Groups].[3]
13
14   What is noteworthy about this description of purpose is that the costs that the

15   original BCM produces are not the actual costs of any particular company.

16   Despite this acknowledgment, the proponents of the Hatfield model incorrectly

17   propose to use parts of the BCM to produce actual prices for the incumbent

18   LEC's unbundled elements.

19   Q.   Are there yet more recent versions of the Hatfield model?

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[2] I understand that Sprint and US West released an updated version of the BCM to the FCC on July 3,
    1996. I have not had an opportunity to review this new version. It is clear, however, that Version 2.2
    of the Hatfield model uses parts of the *original* BCM.

[3] MCI Telecommunications Corporation, NYNEX Corporation, Sprint Corporation, and US West Inc.,
    "Benchmark Cost Model," (submitted to the FCC, CC Docket No. 80-286, September 12, 1995), at 3
    (emphasis supplied).

1

1   A.   Yes. In the FCC Interconnection proceeding (CC Docket No. 96-98), AT&T

2   released Version 2.2 of the Hatfield model. This is the model that Mr. Floyd's

3   testimony describes. At the same time, MCI attached an updated version of a

4   "greenfield" model to its comments to the FCC.[4] Although the bulk of my

5   discussion focuses on Version 2.2 (and its use of the original BCM), I refer to

6   some of the other "Hatfield models" as needed.

7   Q.   Do you consider your review of the Hatfield model to be complete?

8   A.   No. Not only is the model "constantly being refined," it is far from user-friendly.

9   I understand that an electronic version of the model was only recently released.

10   Even then, the model's parts (Hatfield, the original BCM, and the LERG [Local

11   Exchange Routing Guide] file) had to be acquired. In addition, computer

12   hardware requirements are substantial.

13   III. THE HATFIELD MODEL IS INCONSISTENT WITH SOUND ECONOMICS

14   Q.   How does the Hatfield model depart from sound economics?

15   A.   In a number of ways that fail to reflect the costs of a local exchange carrier that is

16   facing increasing competition as a result of technological advancement and

17   regulatory developments. The Hatfield model documentation characterizes the

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[4]   Hatfield Associates, Inc., "The Cost of Basic Network Elements: Theory, Modeling, and Policy
      Implications," March 29, 1996.

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1   model as "scorched node"—it starts with the existing locations of central offices,

2   then builds a brand new system instantaneously from the ground up.[5] That is, the

3   model puts in place all facilities to serve current demand levels without

4   accounting for the growth dynamics that produce real networks.   While

5   proponents of this approach claim that it approximates the textbook definition of

6   long-run cost, it is grossly at odds with how real businesses incur costs,

7   especially capital-intensive firms that expand their facilities by adding capacity in

8   discrete modules.[6] Almost five years ago, Professor Alfred Kahn (a former Chair

9   of the New York Public Service Commission) advised the FCC of the need to

10   employ a realistic and practical perspective.

11   In strict economic terms, the concept of long-run marginal costs
12   relates to a hypothetical situation in which all inputs are variable,
13   and a supplier confronts the possibility of installing entirely new
14   facilities, in effect from the ground up. And the "marginal" relates
15   to the incremental cost of a single unit of output. The concept of
16   long-run incremental cost, in contrast, is more pragmatic: it takes a

---

[5] A number of long-run incremental cost studies performed by local exchange carriers have employed a different version of the "scorched node" assumption. For example, Pacific Bell and GTE have developed costs based upon consensus costing principles adopted by the California Public Utilities Commission. The Hatfield model departs from the California principles in at least two significant ways: (1) Hatfield only uses the existing locations of central offices, while the California principles require that the existing location of outside plant be used as well and (2) by positing an "instantaneous" network, the Hatfield version of "scorched node" ignores the impact of changes in demand on cost.

[6] Even the theoretical definition must be conditioned by reality. For example, Professor Varian has noted: "Long run and short run are of course relative concepts. Which factors are considered variable and which are considered fixed depends on the particular problem being analyzed. You must consider over what time period you wish to analyze the firm's behavior and then ask what factors can the firm adjust during that time period." Hal R. Varian, *Microeconomic Analysis* (3d ed. 1992), at 66.

1   firm's past history as given, does not assume that it is writing on a
2   blank slate, but recognizes that it will ordinarily be planning the
3   installation of new capacity, at whatever that additional investment
4   will cost given its current situation, and it spreads the costs over
5   either the total output of that additional capacity—in that sense it is
6   a kind of average incremental cost—or over the additional output
7   that is likely to be induced by a price reduction under consideration
8   (or curtailed in response to a price increase.)[7]
9

10   Q.   Does the Hatfield model properly represent the fact that telecommunications

11   carriers are subject to continuous technological change?

12   A.   Absolutely not.   In an industry with rapid technological progress, such as

13   telecommunications, no company would set prices based upon costs determined

14   by the Hatfield model. The reason is that as technology advances, basing prices

15   on the Hatfield view of the world would never recover costs. Professor Kahn

16   and I recently noted this phenomenon as follows:

17   In a world of continuous technological progress, it would be
18   irrational for firms constantly to update their facilities in order
19   completely to incorporate today's lowest-cost technology, as
20   though starting from scratch: investments made today, totally
21   embodying today's most modern technology, would instantaneously
22   be outdated tomorrow and, in consequence, never earn a return
23   sufficient to justify the investments in the first place. For this
24   reason, as Professor William J. Fellner pointed out many years ago,
25   firms even in competitive industries would systematically practice
26   what he calls "anticipatory retardation," adopting the most modern
27   technology only when the progressively declining real costs had
28   fallen sufficiently below currently prevailing prices as to offer them
29   a reasonable expectation of earning a return on those investments

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[7] Affidavit of Alfred E. Kahn (submitted to the FCC, CC Docket No. 91-141, August 6, 1991).

1   over their entire economic life. In consequence even perfectly
2   competitive prices would not be set at the level of these (totally)
3   current costs—unless, to put it another way, the calculated costs of
4   the new plant included an extremely high rate of return and of
5   depreciation, in reflection of the exposure of any such investments
6   to costs and prices progressively declining in real terms over their
7   life.[8]
8

9   The Hatfield model's scorched approach to cost modeling essentially assumes

10   that a LEC's entire demand for telephone services is constantly up for grabs. In

11   effect, the succession of incumbent LECs would hand over their entire business

12   to the newcomer, which in turn would instantly size its plant to perfectly

13   accommodate this demand, taking advantage of all the economies that come with

14   serving the demand with perfectly sized facilities obtained at the maximum

15   volume discounts. It would be nice if the world worked this way, because we

16   would all like to pay less for what we consume. Unfortunately, it does not. A

17   real firm grows to meet demand as it materializes. As such, it adds capacity

18   taking into account the trade-off between the lower per unit costs of bigger

19   modules (e.g., larger cable sizes) and the costs of carrying the unused capacity

20   that deploying larger modules would entail.

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[8] Declaration of Alfred E. Kahn and Timothy J. Tardiff (submitted to the FCC, CC Docket No. 96-98, May 30, 1996) (footnote omitted). Professor Jerry Hausman's reply affidavit, filed in this docket on the same day, makes a similar point in the context of depreciation. Professor Hausman's findings will be discussed later when depreciation issues are addressed.

1 Q.   Does the Hatfield model exclude other costs that need to be considered in setting

2   prices?

3 A.   Yes. There are two such costs. First, to the extent that historical depreciation

4   rates have lagged behind economic depreciation rates, the reserve deficiencies

5   thus created represent costs that incumbent LECs should continue to have the

6   opportunity to recover. Second, the current configuration of the LEC's network

7   captures the effects of regulatory obligations such as carrier-of-last-resort. To

8   the extent that a hypothetical network fails to represent such legitimate forward-

9   looking costs, its results would understate the actual cost of providing services

10   and unbundled network elements.

11 IV. **THE HATFIELD MODEL INCORRECTLY REPRESENTS LOOP PLANT**
12   **AND SWITCHING**

13 Q.   Mr. Floyd characterized the Hatfield model as conservative. Is he correct?

14 A.   No.   The basis for his characterization is (1) the claim that the use of Census

15   Block Groups (CBG) underestimates loop distances because it assumes a

16   uniform distribution of households within the CBGs, (2) the use of historical

17   factors to estimate out-of-pocket expenses and (3) the inclusion of a 10 percent

18   overhead factor.

19 Q.   Why do Mr. Floyd's three reasons not necessarily result in a conservative

20   analysis?

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1   A.   First, with respect to the uniform distribution of households within CBGs, I note

2   that the developers of the original BCM identified this as a problem primarily for

3   large, low-density CBGs. In fact, New York Telephone has very few CBGs of

4   this type. Over 80 percent of all households are in the two highest density

5   categories of the BCM. Second, the Hatfield model's use of historical factors is

6   *not* conservative for at least two reasons: (1) the factors exclude a large

7   proportion of operating expenses and (2) the multiplicative factors are employed

8   in a manner that reduces out-of-pocket expenses when the amount of investment

9   is understated.[9] Third, because of the large amount of shared and common costs

10   in telecommunications networks, assignment of 10 percent as overheads is hardly

11   conservative.

12   Even if Mr. Floyd is correct on these points (which he is not), his characterization

13   overlooks a host of other factors that cause the model to systematically

14   understate costs. My discussion of these flaws is organized into three major

15   categories: (1) loops, (2) switches, and (3) conversion on investments into

16   monthly amounts.

17   **A. Loops**

---

[9] For this reason, the sponsors of the original BCM "agreed to disagree" in reporting expenses based on
two sets for factors: (1) one similar to the Hatfield model factors and (2) one based on all historical
cost contained in the ARMIS data. The latter factor was almost 50 percent greater than the former.

1   Q.   How does the Hatfield model represent loop plant?

2   A.   For the most part, the Hatfield model's development of loop costs relies on the

3   BCM.

4   Q.   How does the BCM represent loop plant?

5   A.   The BCM starts with the current locations of the LEC's central offices. The

6   model constructs loop plant (feeder, distribution, and associated structures) from

7   the central office locations to the households in the CBG by means of specific

8   engineering rules, e.g., the lines served by a particular central office are the result

9   of assigning CBGs to the closest wire centers.

10   Unfortunately, the BCM assigns substantial percentages of households to the

11   wrong wire center. As a result, the network represented by the BCM departs

12   from the LEC's actual network. The Hatfield model's proponents may argue

13   that the BCM has assigned households more efficiently than the LECs have. A

14   more likely explanation is that the extremely abstract representation of the

15   network—a featureless plain[10]—ignores real world constraints, such as physical

16   barriers, e.g., rivers, lakes, and hills, between a CBG and its closest central office.

---

[10] The only distinguishing characteristics are a number of factors (water table, soil characteristics, and density) used to estimate the cost of installation and support structures for aerial, buried, and underground placements.

1   Because the BCM assumes that loop facilities are installed instantaneously, the

2   model selects the largest available cable sizes to serve a given static volume. In

3   contrast, because real networks evolve as demand grows and changes, firms face

4   a trade-off between deploying larger cable sizes (and enjoying the economies of

5   scale that result at or near full capacity) versus using smaller sizes, thus reducing

6   the carrying costs of the extra inventory that large cable sizes entail. In this

7   regard, the BCM may underestimate loop cost, because it could assign

8   larger/less-costly facilities (on a per-unit basis) than an efficient firm would

9   deploy. Such "savings" are illusory, not real. What has been left out of the BCM

10   is the carrying charges on the unused capacity that the larger cable sizes would

11   require for several years, until actual demand materializes.

12   Q.   What are the problems you have identified with BCM/Hatfield representation of

13   loop plant?

14   A.   Problems fall into three major areas: (1) the use of multiplicative factors to

15   estimate the costs of installation and structures, (2) the abstract representation of

16   distribution facilities, and (3) the use of excessive fill factors.

17   **1. Installation and Structure Multipliers**

18   Q.   How does the BCM estimate the costs of installation and structures for loop

19   plant?

1   A.   For loop plant, both feeder and distribution, the BCM calculates the investment

2   costs of installation and structures by multiplying the cost of cable by factors that

3   represent the installation labor cost and support structure investments. While

4   properly developed factors can give reasonable representations of average

5   installation and structure costs if current conditions are similar to those from

6   which the factors were based, there are two features of the BCM that make these

7   factors problematic.

8   The first problem comes from the fact that changes in the cost of cable pass

9   through directly into changes in the cost of installation and structures. In other

10   words, the model would predict that two otherwise identical areas would have

11   different installation and structure costs if they were served by companies that

12   paid different amounts for their cable. Similarly, the model would predict that

13   cost of installation and structures would decrease when a company is able to

14   .   secure a better discount on the cost of the cable itself.

15   If installation and structures were a modest proportion of total loop investment,

16   the conceptual problem with the multiplier, albeit troublesome, may not have a

17   large impact on estimated total costs. Unfortunately, installation and structures

18   account for a substantial proportion of the investment cost of loop plant. For

19   example, I am advised that cable itself accounts for about only one-third of

1   NYNEX's loop investment costs. That is, because structure and installation

2   costs appear to account for a majority of loop costs, the use of structure

3   multipliers is truly an example of the tail wagging the dog.

4   Q.   Please illustrate the problems that can arise from the use of multipliers.

5   A.   Because the cost of cable itself accounts for only one-third of loop costs, the use

6   of multipliers overstates the impact of a change in the price of cable. For

7   example, if the price of cable decreased by 50 percent, while other prices stayed

8   the same, the cost of loop plant would decrease by approximately 17 percent

9   (50% x 1/3). In contrast, the BCM would predict that loop costs would increase

10   by almost 50 percent.

11   **2. Modeling Distribution Facilities**[11]

12   Q.   How does the BCM model distribution plant?

13   A.   The BCM constructs feeder plant from the central office to the edge of the CBG.

14   All loop plant within a CBG is assumed to be distribution plant. The BCM

15   assumes that CBGs are square in shape and that households are uniformly

16   distributed over the area of the CBG, neither of which is true of real CBGs. The

---

[11] In the Hatfield model, feeder plant is assumed to run from the central office location to the boundary of a CBG. Loop plant within the CBG is assumed to be distribution plant. In engineering terms, feeder plant runs from the central office to the serving area interface (SAI), Loops plant from the SAI to the customer location is distribution plant.

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1   BCM also uses an abstract representation of the distribution plant within a CBG.

2   The BCM assumes that CBGs have exactly four distribution cables of length

3   equal to three-fourths of the square-root of the area of the CBG.[12]

4   Q.   What inaccuracies are introduced by this simplistic representation of distribution

5   plant?

6   A.   The abstract representation of distribution plant can produce results that differ

7   from reality, i.e., loop lengths can be inaccurate, cable sizes can be incorrect, and

8   the number of cables within a CBG can differ from the four cables assigned by

9   the BCM.

10   For example, although the BCM documentation describes CBGs as containing on

11   average 400 households, there is, in fact, considerable variation in the number of

12   households within a CBG. The consequence is that CBGs with a large number of

13   households exceed the size of the distribution areas that particular LECs may

14   employ. In turn, the BCM allows larger copper cable sizes than some LECs

15   typically employ. In New York, while fewer than one percent of loop cables

16   exceed 2,700 pairs, the BCM permits cables as large as 4,200 for feeder and

17   3,600 for distribution. Thus, because larger cables have lower unit (per pair)

18   costs, the BCM would understate the cost of cable investment.

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[12] The model assumes that CBGs are square. Therefore, the square root of the area is the side of the square.

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1   Moreover, the use of exactly four distribution cables in the BCM can cause

2   substantial bias. To see how this abstract representation of distribution plant may

3   introduce distortions, observe first that there are two basic cost drivers of

4   distribution (and feeder) installation and support structure: (1) sheath miles and

5   (2) pair miles. Further observe that BCM estimates the cost of installation and

6   structures by applying multipliers to the price of the cable itself. Accordingly, if

7   there are more than four distribution cables, the BCM will understate the costs

8   that vary with sheath miles.

9   Q. Can you illustrate the errors that using exactly four distribution cables can

10   produce?

11   A. A hypothetical example will illustrate the problem. Consider an area requiring

12   1,000 loops with an average distribution length of 5,000. The following prices

13   prevail:

14   • Cable[13]: $0.01 (per pair foot)

15   • Installation and structure cost (per pair foot): $0.02

16   • Installation and structure cost (per sheath foot): $5.00

---

[13] This is roughly the cost per pair-foot for cable sizes in the 1000 pair range reported in the Hatfield
Model documentation. As a simplification, I assume that changing the number of routes does not
change the required capacity or cable size, so that the same unit price is used.

1

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1　　　The number of pair feet is 5,000,000 (1,000 loops x 5,000 feet). The number of

2　　　sheath feet is 20,000 (4 sheaths x 5,000 feet). Therefore, the distribution

3　　　investment is

4　　　　　• Cable: $50,000 (5,000,000 pair feet x $0.01)

5　　　　　• Installation and structure (pair-feet driven): $100,000 (5,000,000 pair feet

6　　　　　x　$0.02)

7　　　　　• Installation and structure (sheath-feet driven): $100,000 (20,000 sheath

8　　　　　feet x　$5.00)

9　　　　　• Total cost: $250,000

10　　　If the area were actually served by eight cables, rather than the four specified by

11　　　the BCM, sheath feet would increase to 40,000 and total cost would increase by

12　　　$100,000, which is 40 percent higher than the costs produced by the BCM.

13　　　The abstract nature of the BCM's distribution model is of more than academic

14　　　interest. In the network cost elements reported in the May 30 update

15　　　documentation of Version 2.2 of the Hatfield model submitted to the FCC,

16　　　distribution plant accounted for 47 percent of the total cost of switched network

17　　　elements in New York.

1   **3. Fill Factors**[14]

2   Q.   How are fill factors used in a cost model?

3   A.   Because telephone capacity is modular, i.e., it comes in sizes greater than a single

4   unit, there is more capacity in place than volumes in service. Capacity exceeds

5   volume even when the most efficient engineering practices are followed. The

6   ratio of volume in service to capacity is the fill factor.

7   The spare capacity represented by a fill factor less than 1.0 is a *current* economic

8   cost of providing service. In a previous evaluation of the BCM, I participated

9   with Pacific Bell's cost experts in reviewing that model.[15] As part of their review

10   of the BCM engineering rules, Pacific's experts compared the model's fill factors

11   with the actual fill factors that would result from the best engineering practices.

12   In general, the fill factors for feeder plant in the BCM were moderately higher

13   than best practice and the fill factors for distribution plant in high density areas

14   were substantially higher than best practice. Distribution fill factors are relatively

15   low because of the high cost of adding capacity after the support structure has

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[14] A theoretical discussion of these issues appears in Richard D. Emmerson, "Theoretical Foundation of Network Costs," in W. Pollard, editor, *Marginal Cost Techniques for Telephone Services*, National Regulatory Research Institute (1991) at 145-189.

[15] Timothy J. Tarditf, "Evaluation of the Benchmark Cost Model," (prepared on behalf of Pacific Bell, for filing with the California Public Utilities Commission, Rulemaking/Investigation on the Commission's Own Motion into Universal Service and to Comply with Mandates of Assembly Bill 3643, R.95-01-020/I.95-01-021, December 1, 1995).

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1   been built. Accordingly, capacity for an indefinitely long planning horizon is

2   installed initially and utilization of that capacity is low as a result.

3 Q. Does the Hatfield model employ realistic fill factors?

4 A. Unfortunately no. Version 2.2 of the Hatfield model has increased the already

5   somewhat high distribution fill factors in the original BCM, as shown in the table

6   below. This would cause the underestimation of loop costs to be even greater.

7 1.   **BCM**   **Hatfield**

Density Zone	Feeder	Distribution	Feeder	Distribution
1	0.65	0.25	0.65	0.50
2	0.75	0.35	0.75	0.55
3	0.80	0.45	0.80	0.60
4	0.80	0.55	0.80	0.65
5	0.80	0.65	0.80	0.70
6	0.80	0.75	0.80	0.75

1   Q   How do the fill factors used in the Hatfield model compare to those dictated by

2   NYT's engineering practices?

3   A.   On a company-wide basis, I estimate that NYT's average fill for loop plant is

4   about 59 percent. (This factor is in fact higher than the Pacific Bell fill factor

5   discussed elsewhere in my testimony.) In contrast, the Hatfield model produces

6   an average fill for loop plant of over 73 percent.

7   Q.   What accounts for this difference in fill factors?

8   A.   As I understand it, NYT's cost estimates are based on the average fill factor,

9   while the Hatfield model uses a design (or objective) factor. Because the average

10   fill factor accounts for the spare capacity necessary for efficient provision of

11   service, it is a *current* cost of doing business which needs to be recovered in the

12   prices charged by NYT.

13   The Hatfield model's use of unrealistically high fill factors causes costs to be

14   understated in two ways.

15   Q.   What is the first way excessive fill factors bias the result?

16   A.   Because (1) the fill factor, in part, determines how much cable is needed and (2)

17   the cost of all the associated installation and structures are estimated by

18   multiplicative factors, overestimation of the fill factor will cause an unrealistically

19   large drop in the Hatfield model's loop costs. Because a higher fill factor would

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1   produce less cable investment, the Hatfield model produces proportionately less

2   installation and structure investment as well. In reality, even if the Hatfield fill

3   factors were realistic, the savings in installation and structure would be

4   considerably less than proportionate, e.g., a smaller cable would be placed in the

5   same conduit.

6   Q.   And what is the second source of bias introduced by high fill factors?

7   A.   The Hatfield model appears to be based on the belief that competitive firms

8   would have minimal spare capacity. In this regard, the FCC's finding on spare

9   capacity in interstate long-distance, which was one of the bases for granting

10   AT&T non-dominant status, contradicts this apparent belief:

11   AT&T asserts, and no one disputes, that MCI and Sprint alone can
12   absorb overnight as much as fifteen percent of AT&T's total 1993
13   switched demand at no incremental capacity cost; that within 90
14   days MCI, Sprint, LDDS/Wiltel, using their existing equipment,
15   could absorb almost one-third of AT&T's total switched capacity;
16   or that within twelve months, AT&T's largest competitors could
17   absorb almost two thirds of total switched traffic for a combined
18   investment of $660 million. Thus, AT&T's competitors possess the
19   ability to accommodate a substantial number of new customers on
20   their networks with little or no investment immediately, and
21   relatively modest investment in the short term. We therefore
22   conclude that AT&T's competitors have sufficient excess capacity
23   available to constrain AT&T's pricing behavior.[16]
24

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[16] Federal Communication Commission, In the Matter of Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier, FCC 95-427 (October 15, 1995) ¶ 59.

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1   To cast the FCC findings in terms relevant to the current discussion, note that

2   MCI and Sprint combined are roughly one-half of AT&T's size. Overnight they

3   can absorb 15 percent of AT&T's capacity. This implies that MCI and Sprint

4   have at least 30 percent spare capacity that could be deployed overnight.

5   The implication of these findings is that, if anything, competition may require a

6   firm to invest in more, rather than less spare capacity to be flexible enough to

7   respond the vicissitudes of the market. Failure to recover in current revenues the

8   current cost of business caused by the spare capacity necessary to operate in the

9   competitive environment would be detrimental to the shareholders of such

10   companies, perhaps even forcing some of them out of business.

11 Q. Has there been any regulatory review of the dispute involving fill factors?

12 A. Yes. In a recent Proposed Decision on cost studies, an Administrative Law

13   Judge of the California Commission concluded that Pacific Bell had appropriately

14   represented spare capacity in its cost studies.[17] In particular, the Proposed

15   Decision rejected arguments that fill factors commensurate with those used in the

16   Hatfield model should be employed.

17 **B. Switching**

18 Q. How does the Hatfield model estimate the cost of local switching?

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[17] California Public Utilities Commission, Proposed Decision of ALJ McKenzie, July 2, 1996.

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1   A.   Version 2.2 of the Hatfield model systematically understates the cost of local

2   switching. By selectively using heavily discounted prices for new switches and

3   by assuming that a local service provider would instantly install all of the

4   switching capacity it needs at once, the Hatfield model produces results that are

5   substantially lower than the forward-looking local switching costs that real

6   telephone providers actually incur.

7   Q.   Please describe Hatfield's switching model.

8   A.   Hatfield developed a relationship between switching cost per line and the size of

9   the switch by piecing together information from various sources. In particular,

10   the algorithm is driven by three data points constructed as follows.

11   • Small switch: the cost per line ($241 for 1994) was taken from the
12   Northern Business Information report on the average cost of *new*
13   lines for independent companies. Hatfield associated the average
14   *installed* switch size of 2,782 lines for small LECs (LEC industry
15   less RBOCs), calculated from statistics on lines and switches
16   reported to the FCC for 1993.
17
18   • Medium switch: the cost per line ($104 for 1994) was taken from
19   the Northern Business Information report on the average cost of
20   *new* lines for RBOCs. Hatfield associated the average *installed*
21   switch size of 11,200 for RBOCs, calculated from statistics on lines
22   and switches reported to the FCC for 1993.
23
24   • Large switch: cost per line of $75 for a 80,000 line switch,
25   "obtained from switch manufacturers."
26
27   Hatfield then drew straight lines between the three points to complete the

28   relationship.

1   Q.   Are there problems with Hatfield's representation of switching costs?

2   A.   Yes. Hatfield's approach suffers from at least two problems. First, there is a

3   mismatch between the data sources the model employs. Note, for example, that

4   it matches a 1994 forecasted price with a 1993 average embedded switch size.

5   The approach also assumes that the *average* installed switch is of the same size

6   as the average *new* switch, an assumption that is not necessarily valid.

7   Second, and more fundamental, the Hatfield model ignores the fact that LECs

8   buy additional lines for installed switches as well as new lines for new switches.

9   These additional lines cost more, as the study that Hatfield used for his switch

10   prices suggests:

11   The add-on market continues to retain revenue potential for the
12   suppliers, particularly as the margins on new switches remain below
13   the margins for the add-on market. A digital line shipped and in
14   place will generate hundreds of dollars in add-on software and
15   hardware revenue during the life of the switch. Suppliers can afford
16   to forego losing (sic) a few dollars on the initial line sale in
17   exchange for the increased revenue in the aftermarket, when prices
18   are less likely to be set by competitive bidding.[18]
19

20   The local switching component of the Hatfield model graphically illustrates the

21   fallacy of its scorched view of cost studies. In order for the approach to produce

22   realistic costs (ignoring the data problems identified earlier), a new entrant would

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[18] Northern Business Information, *US Central Office Equipment Market—1994*, at 71.

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1   have to serve customers with initial lines only and also have the volumes to

2   command the discounts that existing LECs apparently command. The fact that

3   LECs expand their switches as demand grows and the existence of a lucrative

4   aftermarket for this expansion demonstrate that the "instant LECs" posited by the

5   Hatfield model are inconsistent with reality.

6   **C. Converting Investments to Annual and Monthly Costs**

7   Q.   How does the Hatfield model convert investments to monthly costs?

8   A.   As described earlier, the various manifestations of the Hatfield model are

9   essentially models of the *investment* component of an LEC's cost structure.

10   These investments are converted into annual and monthly amounts by (1)

11   annualizing the investments through the use of cost-of-capital and depreciation

12   rates and (2) estimating out-of-pocket operating expenses through the use of

13   historical expense to investment ratios. In applying the model for this

14   investigation, Mr. Floyd has corrected one problem in earlier versions of the

15   model: the use of an unrealistically low rate of return.[19] A major problem

16   remains: depreciation rates are too low.

17   Q.   Why are the depreciation rates in the Hatfield model too low?

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[19] Mr. Floyd used New York Telephone's authorized rate of return. In fact, given the uncertainty and competitive forces unleashed by the Telecommunications Act and other regulatory developments, a realistic rate of return may be considerably higher.

1   A.   While long investment lives may have been appropriate for a regulated monopoly

2   provider, the competitive environment fostered by the Telecommunications Act is

3   a different world. The forces of competition itself, as well as the technological

4   change that permeates this industry, invalidate the use of the old, long

5   depreciation lives. In fact, Professor Hausman's May 30, 1996 reply affidavit

6   demonstrates that accounting for the increased risk and uncertainty of

7   competition increases the annual cost related to investments by a multiple of at

8   least 3.

9   The Version 2.2 of the Hatfield model lists asset lives by type of facility, e.g., end

10   office switches have a life of 20 years in the model. In contrast, earlier versions

11   utilized an average life. For example, the BCM posited an average life of 18

12   years for all plant. Inspection of the lives in Version 2.2 suggest an average life

13   of at least 18 years, which is equivalent to an annual depreciation rate of 5.7

14   percent. This rate is well short of the 1994 book depreciation of 7.16 percent for

15   RBOCs, let alone the higher true economic depreciation rate.[20]

16   The 1994 Hatfield Report indicates that changing depreciation from an average

17   20 year life (5 percent rate) to 15 years (6.7 percent rate) would increase basic

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[20] Federal Communications Commission, Statistics of Communications Common Carriers, 1994/1995 Edition, Table 2.9.

1   service costs by 13 percent.[21]   Applying this relationship to the difference

2   between the depreciation rate implied by an 18 year life and the RBOC's current

3   book depreciation rate produces a cost increase of 12.6 percent.[22]

4   Of course economic depreciation rates are much higher.   For example,

5   Schmalensee and Rohlfs reported that AT&T's depreciation rate is 18.5

6   percent.[23] Even AT&T's 1994 book depreciation rate of about 11 percent is

7   much higher than the rates used in the Hatfield model. Using the Schmalensee-

8   Rohlfs and AT&T's book depreciation rates in the relationship from the 1994

9   Hatfield report increases costs by 100 percent and 42 percent, respectively.

10   V.   CONCLUSIONS

11   Q.   What conclusions can be drawn from your evaluation of the Hatfield model?

12   A.   The fundamental flaws in the Hatfield model are that (1) it models the cost of no

13   realistic local service provider and certainly not the incumbent LECs who will

14   actually sell the unbundled elements it attempts to cost and (2) particular inputs

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[21]These sensitivity tests are primarily illustrative. When the computer files for Version 2.2 are available
and installed, sensitivity tests on the cost-of-capital and depreciation factors can be performed in a
more direct manner (if the program code allows these factors to be changed by the user).

[22] I am informed that New York Telephone's average depreciation life is 15.3 years, which implies a
depreciation rate of 6.5 percent. The difference between this rate and that used in the Hatfield model
implies that the Hatfield model's costs understate New York Telephone's costs by at least 7.6 percent.

[23]Richard Schmalensee and Jeffrey H. Rohlfs, "Productivity Gains Resulting From Interstate Price Caps
for AT&T," National Economic Research Associates, September 1992.

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1   and processes appear to systematically understate the costs of network elements.

2   Indeed, at the same time that AT&T reported to the FCC that it would cost

3    $1,240 per customer if AT&T provided local service to 20 percent of the market

4   (likely the least costly part of the market), it and MCI are supporting models that

5   produce investment costs of only $840 per line.[24]

6   Like any model, the Hatfield model is best interpreted in the context of why it

7   was built and what objectives it is intended to foster. The architects and

8   sponsors of the Hatfield model are quite clear in their purpose—they want to buy

9   elements from the LECs, most prominently switched access, at rates far below

10   current rates and even below the costs of the LECs require to produce these

11   elements. While we would all like to pay lower prices, markets only permit this

12   when those prices are commensurate with the costs of production.

13   The Hatfield model developers defend their costs by arguing that any difference

14   between the costs of their model and costs reported by the LECs (either

15   accounting costs that are required by law and by regulators or the cost produced

16   by LEC incremental cost models) represent the costs of overinvestment. For

17   example, the report describing the "greenfield" version of the Hatfield model that

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[24] The FCC's April 19, 1996 Notice of Proposed Rulemaking in CC Docket No. 96-98 listed the costs AT&T reported it would incur. The Hatfield investment per line is calculated from the "greenfield" version of the model.